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Comportamento ecofisiologico di piante affette da Flavescenza Dorata (FD)

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05 May 2023

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Comportamento ecofisiologico di piante di vite affette da FD

Flavescence dorée phytoplasma deregulates stomatal control of photosynthesis in *Vitis vinifera*

Annals of Applied Biology 162: 335–346 (2013)

Marco Vitali, Walter Chitarra, Luciana Galetto, Domenico Bosco, Christina Marzachì, Maria Lodovica Gullino, Federico Spanna and Claudio Lovisolo

Finanziamento Masgrape, Regione Piemonte

Introduction

Aim: To highlight which mechanism controls leaf to atmosphere gas exchange during FD infection and recovery

Introduction:

- Flavescence dorée (FD) is caused by the 16SrV-C, -D, '*Candidatus* Phytoplasma vitis' (non-culturable plant-pathogenic prokariotes)
- Phytoplasmas are transmitted by a vector (Scaphoideus titanus B.)
- Symptoms: yellowing or reddening of the leaves (no photosynthesis), stunting, downward leaf rolling, shortening of internodes, bunch shriveling, and general decline that may result in plant death. Do symptoms take place after the block of phloem transport?

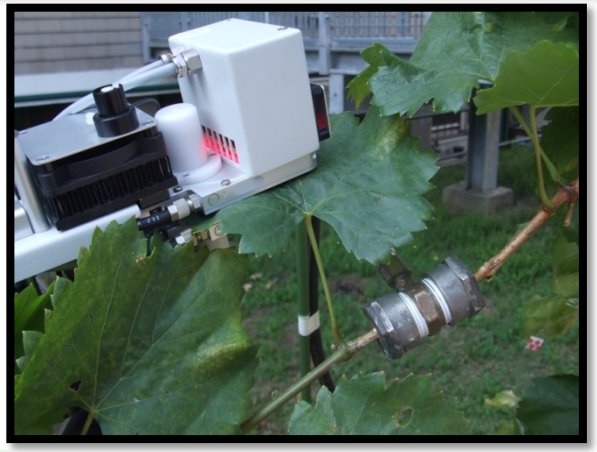
Note that:

- FD-infected vines may show a spontaneous remission of symptoms (Recovery, REC)
- Different susceptibility among cultivars

Materials and Methods

- Measurements performed on 2 vineyards: Barbera and Nebbiolo
- Plant physiology monitored by a portable gas exchange and fluorescence system.
- Four groups of plants were monitored (diagnosis were performed by Entomologists at University and CNR):

- Healthy (PCR negative)
- FD-infected (FD) (PCR positive)
- Recovery (REC1) plants infected in the previous year (PCR negative)
- Recovery 2 (REC2) plants infected two years before (PCR negative)



Population of plants used for eco-physiological measurement

		2008	2009	2010
'Barbera'	healthy	12	12	12+3*
	FD	12	7	5+3*
	REC1		5	2
	REC2			5
	Tot	24	24	30
'Nebbiolo'	healthy	10	10	10
	FD	10	9	7
	REC1		1	2
	REC2			1
	Tot	20	20	20

*=three plants were added in 2010

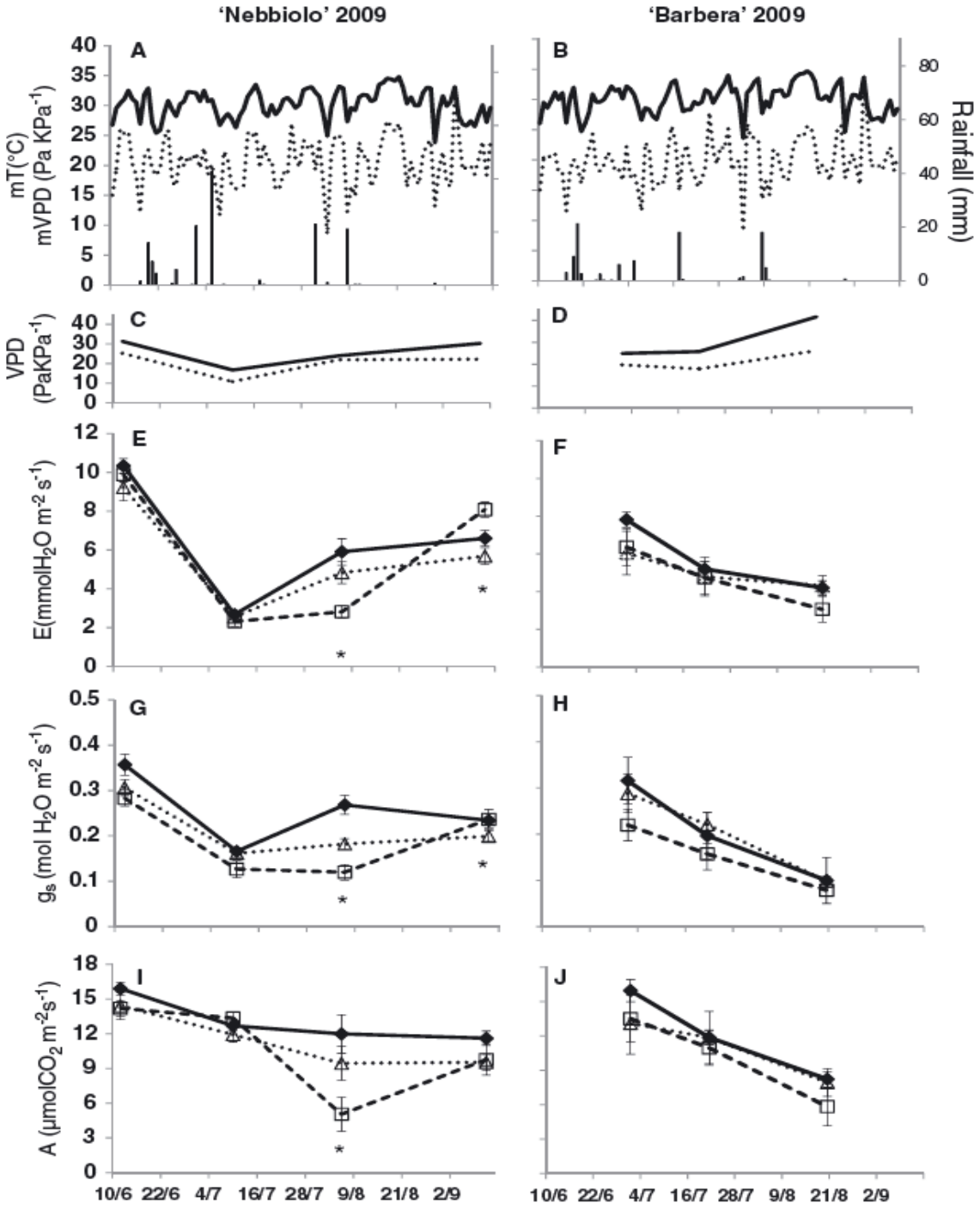
Recovery percentage in the four experimental years in the two vineyards

'Barbera'	2008	2009	2010	2011	
FD	100% (n=13)	100% (n=11)	100% (n=70)		
REC1		61.5 % (n=8)	54.5% (n=6)	51.4% (n=36)	53%
REC2			75 % (n=6)	83.3% (n=5)	46%

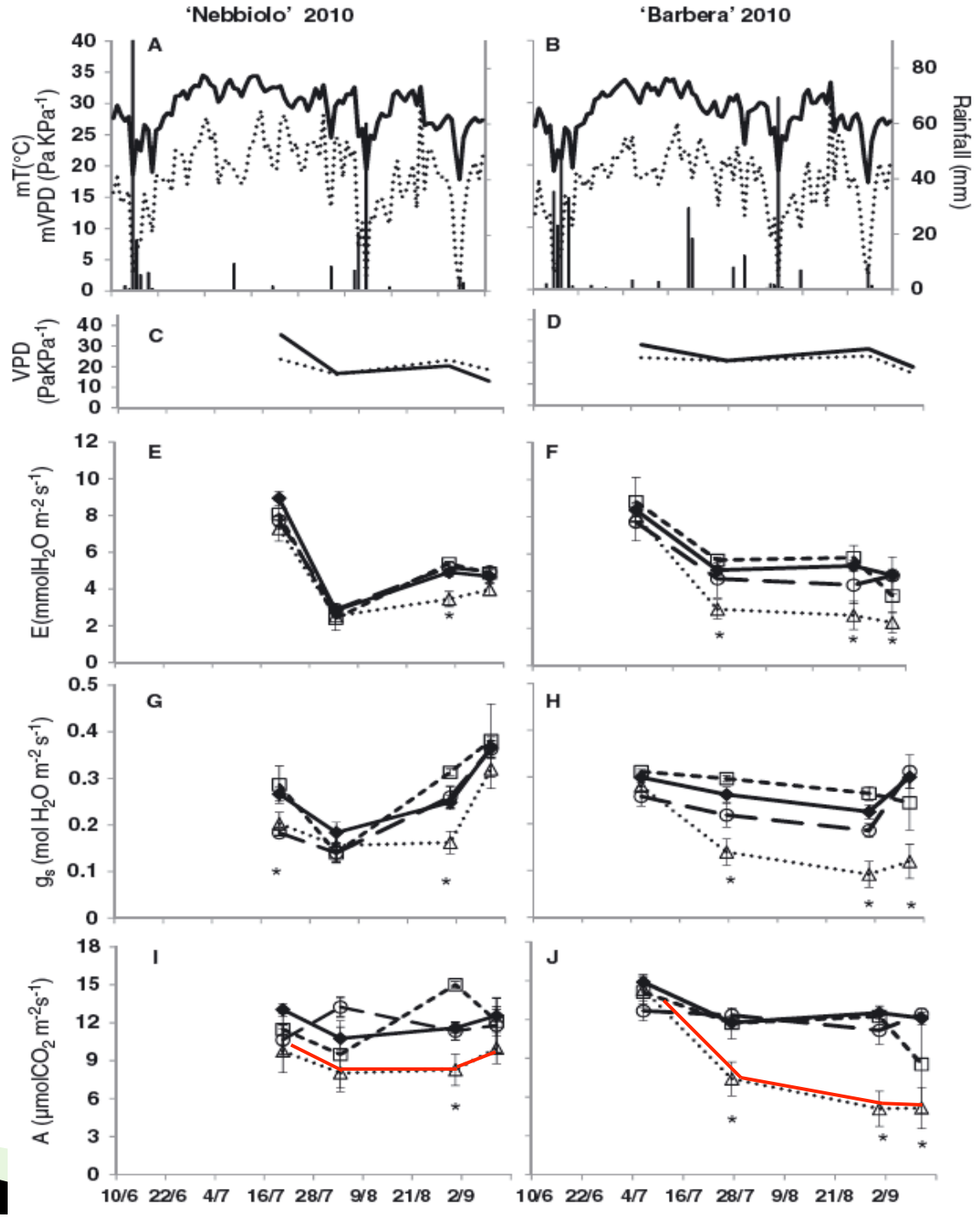
'Nebbiolo'	2008	2009	2010	2011	
FD	100% (n=13)	100% (n=11)	100% (n=13)		
REC1		23.1% (n=3)	9% (n=1)	30.7% (n=4)	22%
REC2			33.3% (n=1)	100% (n=1)	8%

In brackets the number of plants

Results

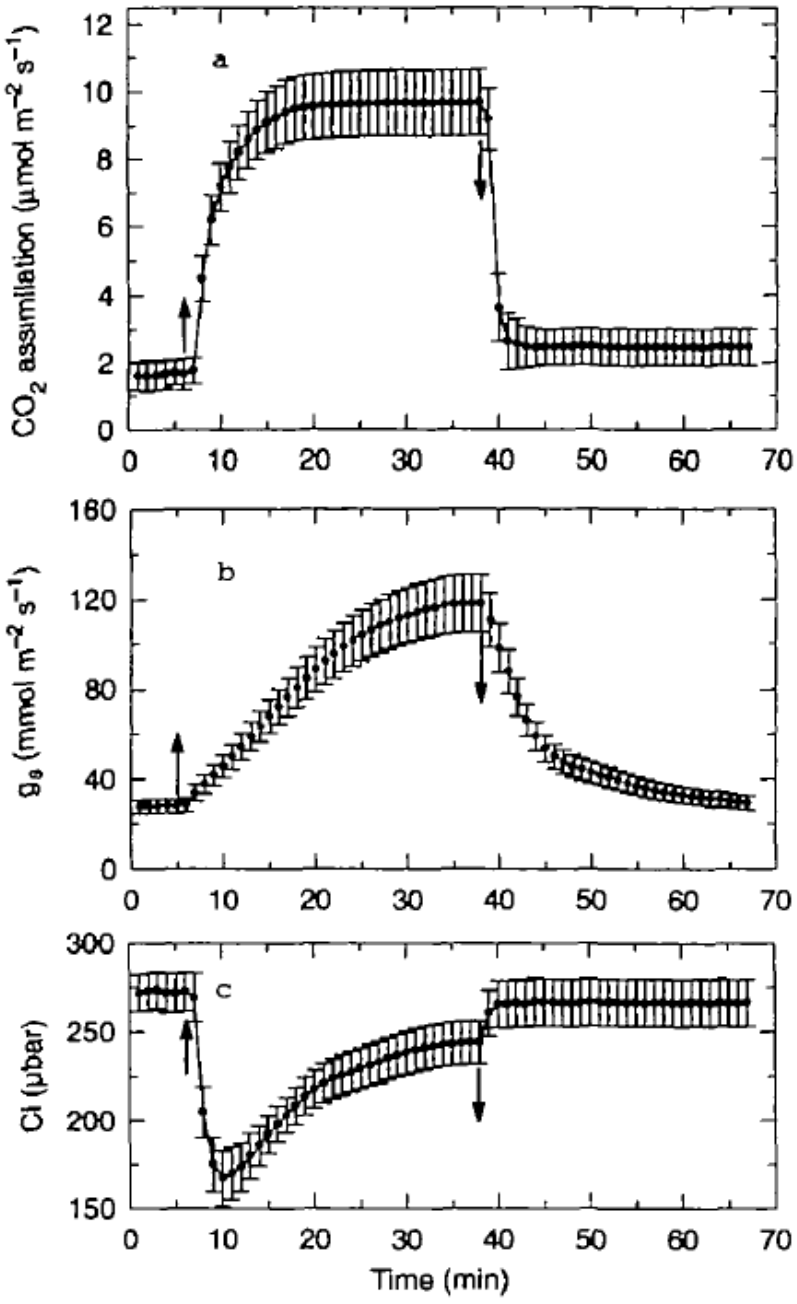

'Nebbiolo' 2009
'Barbera' 2009
A
B
C
D
E
F
G
H
I
J
mT(°C)
mVPD (Pa KPa-1)
Rainfall (mm)
VPD (PaKPa-1)
E(mmolH2O m-2 s-1)
gs (mol H2O m-2 s-1)
A (µmolCO2 m-2s-1)
10/6 22/6 4/7 16/7 28/7 9/8 21/8 2/9
ctrl
REC1
FD

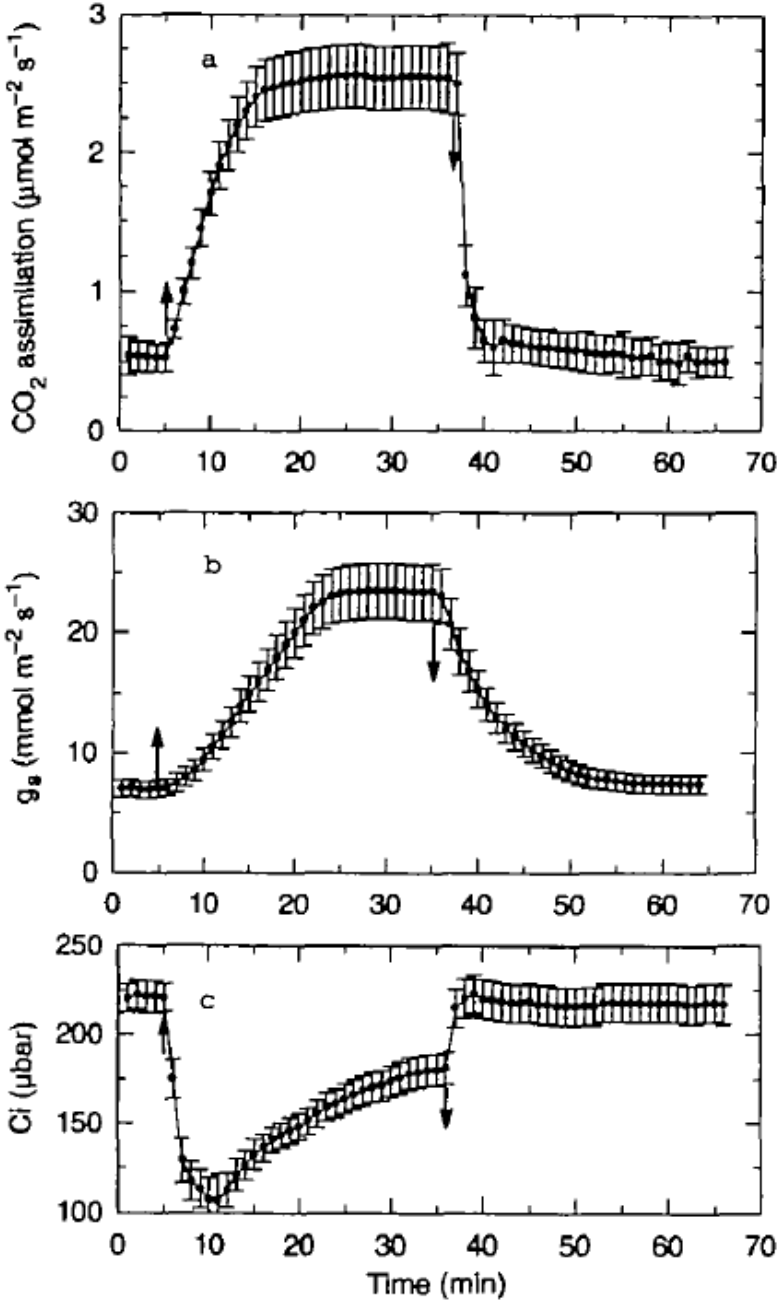
Results


'Nebbiolo' 2010
'Barbera' 2010
A
B
C
D
E
F
G
H
I
J
mT(°C)
mVPD (Pa KPa-1)
Rainfall (mm)
VPD (PaKPa-1)
E(mmolH2O m-2 s-1)
gs (mol H2O m-2 s-1)
A (µmolCO2 m-2s-1)
10/6 22/6 4/7 16/7 28/7 9/8 21/8 2/9
ctrl
REC1
FD
REC2

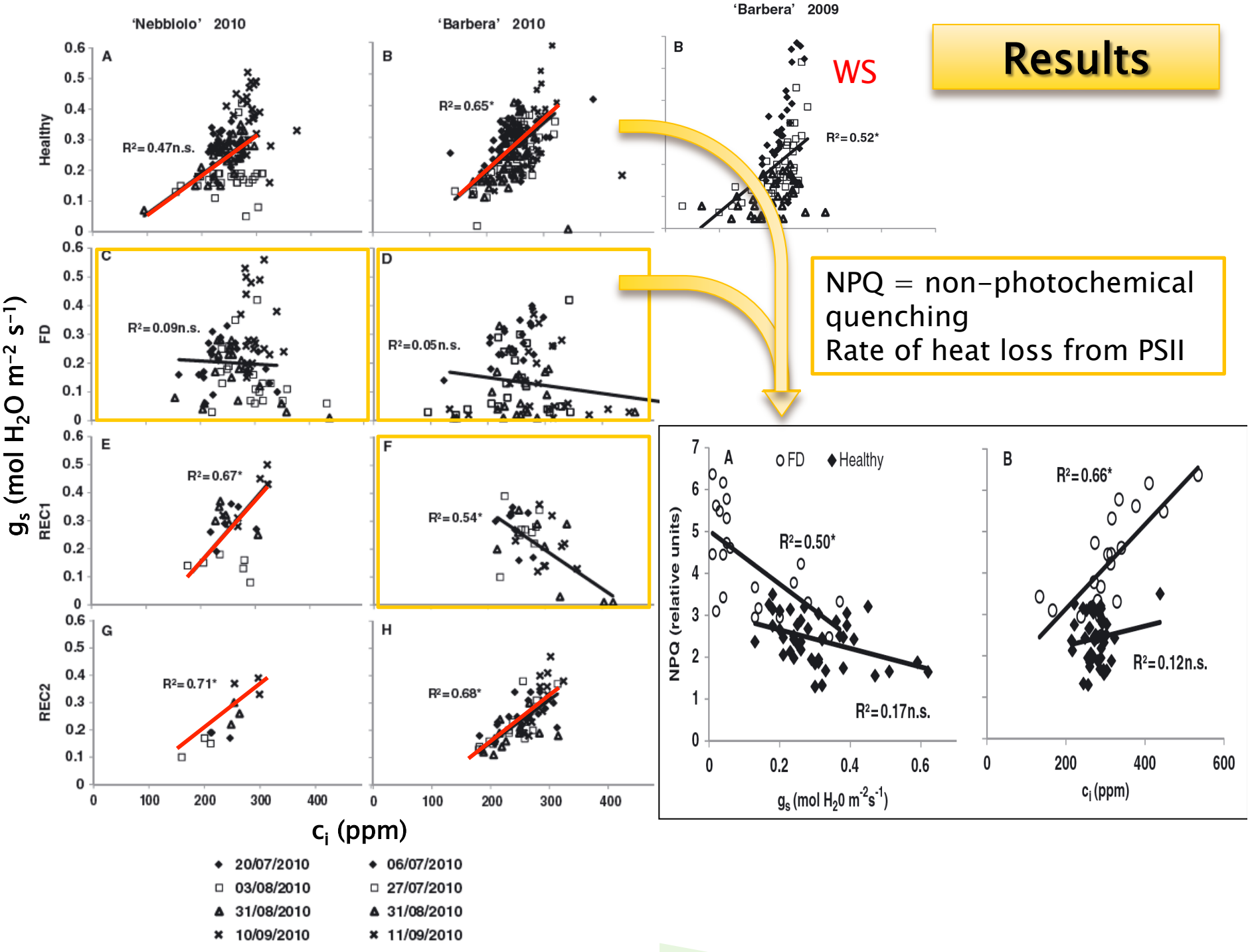
Well watered

Water stress





Results



NPQ = non-photochemical quenching
Rate of heat loss from PSII

Conclusions

✓ Disease slows down Calvin cycle with a consequent rise in c_i → metabolic leaf gas exchange limitation and photo-damages;

✓ Barbera shows higher susceptibility to FD than Nebbiolo plants, associated with a detrimental effect on physiological performances recorded;

✓ Different attitudes to recovery from FD between the cultivars

✓The REC2 *status* corresponded to a stable remission of symptoms